



Robert Mancini
Project Manager, Downstream
Chevron Environmental Management Company
1200 State Street
Perth Amboy, NJ 08861
Tel: (732) 738-2023
Fax: (732) 738-2039
RMancini@Chevron.com

April 23, 2019

Mr. Ricky Vargas
United States Environmental Protection Agency Region 2
290 Broadway, 19th Floor
New York, NY 10007

**Re: No Further Action Justification for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility
Perth Amboy, New Jersey
SRP PI # 003621**

Dear Mr. Vargas:

Enclosed please find the No Further Action (NFA) Justification for Arsenic in Surface Soil: Central Yard. The yard is located at the Former Chevron Perth Amboy Facility (Facility). This report summarizes the results of investigations performed to evaluate arsenic impacts associated with surface soil (0 to 2 feet below ground surface) in the Facility's Central Yard under the Resource Conservation and Recovery Act Hazardous and Solid Waste Amendments Permit. This report also provides technical justification for an NFA determination for arsenic in surface soil within the Central Yard.

Chevron kindly requests that the NFA Justification for Arsenic in Surface Soil: Central Yard is reviewed before June 1, 2019. If you require additional information regarding this NFA Justification, please contact me at (732) 738-2023.

Sincerely,

Robert Mancini
Project Manager, Downstream

cc: Lynn E. Vogel – NJDEP, Bureau of Case Management
Brendan Leehan – Buckeye Partners LLC

D-ID Number 2019-011-31
Enclosure (as described)

Mr. Ricky Vargas

April 23, 2019

2

bcc: Ken Siet - TRC
Todd Frantz – Parsons

D-ID Number 2019-011-31

NO FURTHER ACTION JUSTIFICATION FOR ARSENIC IN SURFACE SOIL: CENTRAL YARD

FORMER CHEVRON PERTH AMBOY FACILITY PERTH AMBOY, NEW JERSEY

Prepared for:



**Chevron Environmental Management Company
Perth Amboy, New Jersey 08861**

Prepared by:

PARSONS

**200 Cottontail Lane
Somerset, New Jersey 08873**

**APRIL 2019
Project No. 451534.31300**

D-ID Number: 2019-011-31

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	Regulatory Background	1
1.2	Central Yard Lithology.....	2
1.3	Relevant Documents	2
1.4	Report Organization	3
2.0	OVERVIEW OF ARSENIC SAMPLING METHODOLOGY.....	4
2.1	CMI Arsenic in Surface Soil Sampling Approach	4
2.1.1	Arsenic Sample Locations	4
2.1.2	Sample Collection	4
2.1.3	Arsenic Sample Intervals.....	5
2.1.4	Analytical Methods	5
2.1.5	Data Validation.....	5
2.2	XRF Arsenic Correlation.....	6
3.0	ARSENIC-IMPACTED SOIL INVESTIGATIONS.....	7
3.1	AOC 40.....	7
3.1.1	AOC 40 Background	7
3.1.2	Arsenic in Surface Soil Investigations.....	8
3.1.3	Investigation Results	8
3.2	SWMU 34	8
3.2.1	SWMU 34 Background	8
3.2.2	Arsenic in Surface Soil Investigations.....	11
3.2.3	Investigation Results	13
4.0	PAOC REMEDIAL INVESTIGATION RESULTS	15
5.0	INSTITUTIONAL CONTROLS	16
6.0	CONCLUSIONS AND RECOMMENDATIONS	17
7.0	REFERENCES.....	18

LIST OF TABLES

Table No.	Title
1.	AOC 40 Arsenic Soil Sample Depths and Analytical Results
2.	SWMU 34 Arsenic Soil Sample Depths and Analytical Results

LIST OF FIGURES

Figure No.	Title
1.	Site Location on a USGS Map
2.	Aerial Photograph of Perth Amboy Facility: Central Yard
3.	AOC, PAOC, SWMU, and 2013 Arsenic Cap FDR Area Locations
4.	Arsenic Results in Soil, AOC 40
5.	Arsenic Results in Soil, SWMU 34

LIST OF APPENDICES

Appendix No.	Title
A.	Historical and PDI Soil Boring Logs (on CD)
B.	Eurofins Lancaster Laboratories Analytical Data Packages (on CD)

LIST OF ACRONYMS

Acronym	Definition / Description
AOL	Area of concern
AST	Aboveground storage tank
BaP	Benzo(a)pyrene
bgs	Below ground surface
Buckeye	Buckeye Perth Amboy Terminal LLC
CAMU	Corrective Action Management Unit
CCR	Construction completion report
CEMC	Chevron Environmental Management Company
CM	Corrective measure
CMI	Corrective measure implementation
CMS	Corrective Measure Study
DVM	Data Validation Module
EIM	Environment Information Management
EISB	Enhanced in-situ bioremediation
ESS	Ex situ stabilization
Facility	Former Chevron Perth Amboy Facility
FDR	Final Design Report
GPS	Global Positioning System
GWQS	(NJDEP) Groundwater Quality Standards
HFM	Historic Fill Map
HSWA	Hazardous and Solid Waste Amendments
ISCO	In Site Chemical Oxidation
ISS	In situ stabilization
IWP	Implementation work plan
LLC	Limited liability company
µg/L	Microgram(s) per liter
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
MSL	Mean sea level
NFA	No Further Action (report/determination)
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
PAH	Polycyclic aromatic hydrocarbon
PAOC	Potential Area of Concern
PDI	Pre-design investigation
PID	Photoionization detector

ppm	Part(s) per million
PRB	Permeable reactive barrier
QC	Quality Control
QAPP	Quality Assurance Project Plan
RAO	Response Action Outcome
RCRA	Resource Conservation Recovery Act
RDCSRS	(New Jersey) Residential Direct Contact Soil Remediation Standards
RFI	RCRA Facility Investigation
ROW	Right-of-Way
SVOC	Semi-volatile organic compound
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile organic compound
XRF	X-ray fluorescence

1.0 INTRODUCTION

This No Further Action (NFA) report summarizes the results of soil investigations performed to evaluate arsenic impacts associated with surface soil (0 to 2 feet below ground surface [bgs]) in the Central Yard at the former Chevron Perth Amboy Facility (Facility) under the Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments (HSWA) Permit. This report also provides technical justification for NFA of arsenic in surface soil in the Central Yard.

The Facility is located at 1200 State Street in Perth Amboy, New Jersey, as shown on **Figure 1**. The Central Yard is triangular in shape, bound by Maurer Road to the north, a Conrail right-of-way (ROW) to the east, and a North Jersey Coast Line ROW to the west (**Figure 2**).

1.1 Regulatory Background

Chevron received a RCRA HSWA Permit for the Facility on June 1, 1994. Following permit issuance, Chevron performed a RCRA Facility Investigation (RFI) (Chevron 1997, 2003, and 2008a) and submitted a Corrective Measures Study (CMS) (Chevron 2008b) to the New Jersey Department of Environmental Protection (NJDEP) and United States Environmental Protection Agency (USEPA). Capping arsenic-impacted surface soil was one of the alternatives evaluated in the CMS Final Report (Chevron 2008b). Based on subsequent correspondence with the NJDEP and USEPA, capping was the selected corrective measure (CM) to address surface soil (0 to 2 feet bgs) with arsenic concentrations greater than 20 milligrams per kilogram (mg/kg) in the Central Yard. The USEPA issued a RCRA HSWA Permit Renewal (USEPA ID No. NJD081982902) for the Facility, with an effective date of September 3, 2013.

The 2013 HSWA Permit Renewal identified the following areas in the Central Yard requiring containment consisting of a cap with filing a deed notice for arsenic concentrations > 20 mg/kg in surface soil:

- Area of Concern (AOC) 40
- Solid Waste Management Unit (SWMU) 34

In 2013, the Arsenic Cap Final Design Report (FDR) (Chevron 2013a) was prepared to describe the design, approach, and methods to implement a cap over arsenic-impacted surface soil identified during soil investigations. As described in Section 6.5 of the 2013 Arsenic Cap FDR, area AS-MY10 was associated with AOC 40. Arsenic concentrations greater than 20 mg/kg were detected in AS-MY10 at depths deeper than 2 feet bgs. However, arsenic concentrations less than 20 mg/kg were detected at depths from 0 to 2 feet bgs. This area was approved for NFA by the NJDEP in a comment letter dated June 4, 2014.

Chevron submitted a Draft Deed Notice for the Central Yard of the Facility to the NJDEP and USEPA on February 27, 2019 pursuant to the New Jersey Administrative Code (N.J.A.C.) 7:26E-8.2 to address contaminants of concern in soils that remain above their respective New Jersey Residential Direct Contact Soil Remediation Standards (Chevron

2019). Upon review and approval of the Central Yard Draft Deed Notice, it will be filed with the County of Middlesex, NJ. Once the deed notice is approved, it is anticipated the USEPA will issue a CA 550 determination (certification of remedy completion or construction completion).

1.2 Central Yard Lithology

The presence of fill material in the Central Yard has been documented through the Potential Area of Concern (PAOC) investigation (Chevron 2014), RFI, CMS, and soil borings advanced during pre-design investigations (PDIs) as part of CM implementations (CMIs). Fill material has also been documented through a review of the NJDEP Historic Fill of the Perth Amboy Quadrangle, Historic Fill Map HFM-62 (NJDEP Land Use Management, New Jersey Geological Survey, 2004). Fill covers the land surface throughout the entire Central Yard.

In general, the Central Yard lithology is composed of the following stratigraphic progression: fill overlying gray clay (Clay Horizon A) and glacial till. Groundwater throughout the Central Yard was detected in the fill layer perched on the native clay and till. The fill material is described as soil containing varying amounts of sand, silt, clay and gravel mixed with brick fragments, wood, tile and concrete debris. Review of Central Yard borings logs did not reveal the presence of catalyst beads, sludge, or layers of asphalt or tar that would typically be associated with refinery-derived wastes. The thickness of the fill layer varies from 7 to 19 feet. Beneath this layer is native clay (Clay Horizon A), which varies between 3 and 19 feet thick. Intermittent layers of till were observed within the clay layer.

The description of fill material encountered is consistent with the NJDEP description and definition of historic fill material (NJDEP 2013). Site-wide exceedances of soil delineation criteria associated with arsenic are indicative of historic fill material deposited to raise the topographic elevation of the Facility. This material was most likely contaminated prior to emplacement and is not connected with the operations at the location of emplacement. Such contamination is likely associated with the historical practice of using fill material to raise topography in relatively low elevation areas to facilitate expansion.

1.3 Relevant Documents

The following documents addressing arsenic-impacted surface soil in the Central Yard were submitted to the NJDEP and USEPA:

- **Arsenic Cap FDR (Chevron 2013a)** – Chevron submitted the Arsenic Cap FDR to the NJDEP and USEPA in May 2013. The FDR described the design, approach, and methods employed to implement a cap over the arsenic-impacted surface soil identified during PDIs.
- **Chevron Letter in Response to the NJDEP Comments on the Arsenic Cap FDR** – Chevron sent a letter to the NJDEP on April 23, 2014, which addressed the agency's Arsenic Cap FDR comments.

- **NJDEP Letter in Response to Chevron's Response to the NJDEP Comments on the Arsenic Cap FDR (NJDEP 2014)** - NJDEP approved the documents in a letter to Chevron dated June 4, 2014.

1.4 Report Organization

Following this introduction, the NFA report is organized into the following sections:

- Section 2: Overview of Arsenic Sampling Methodology – summarizes the methods used during surface soil investigations.
- Section 3: Arsenic-Impacted Soil Investigations – summarizes the findings of surface soil investigations at each AOC and SWMU.
- Section 4: PAOC Remedial Investigation Results – summarizes the PAOC areas in the Main Yard attributed to HFM.
- Section 5: Institutional Controls – summarizes the institutional controls that will be implemented following this report.
- Section 6: Conclusions and Recommendations – summarizes the NFA justification for the Main Yard.
- Section 7: References – provides references for documents cited in the NFA report.

2.0 OVERVIEW OF ARSENIC SAMPLING METHODOLOGY

2.1 CMI Arsenic in Surface Soil Sampling Approach

This section presents the sampling approach, strategy, criteria, and assumptions used during historical investigations and PDIs of potentially arsenic-impacted surface soil in the Central Yard. Boring logs containing soil descriptions for borings advanced during historical investigations and PDIs are included in **Appendix A (on CD)**.

2.1.1 Arsenic Sample Locations

AOCs and SWMUs outlined in the 2013 HSWA Permit Renewal that recommended capping as a CM to address arsenic concentrations >20 mg/kg in surface soil were evaluated to determine if data gaps existed for arsenic within surface soil. The following was considered when evaluating boring locations within each AOC and SWMU:

- AOCs and SWMUs with data gaps based on the vertical extents of existing arsenic-impacted soil deeper than 2 feet bgs: There were historical soil boring locations that contained an arsenic concentration greater than 20 mg/kg from a depth interval below 2 feet bgs that were not vertically delineated stratigraphically above the exceedance. Surface soil (0 to 2 feet bgs) samples were typically collected from these to complete vertical delineation.
- AOCs and SWMUs with data gaps based on the lateral extents of existing arsenic-impacted surface soils: For historical soil borings with an arsenic concentration greater than 20 mg/kg in surface soil (0 to 2 feet bgs), step-out surface soil samples were collected in a grid pattern to horizontally delineate arsenic-impacted surface soil.
- AOCs and SWMUs in the 2013 HSWA Permit Renewal that overlap with other proposed remediation technologies: Areas identified for in-situ stabilization (ISS) for lead-impacted soil, in situ chemical oxidation (ISCO) for benzene-impacted soil, and ex situ stabilization (ESS) for benzo(a)pyrene (BaP) and/or hazardous lead-impacted soil were investigated if arsenic-impacted surface soil was not removed during these CMs.

During surface soil investigations, arsenic-impacted soil was delineated horizontally to define the lateral area with arsenic concentrations greater than 20 mg/kg within depths ranging from 0 to 2 feet bgs. In general, historical soil borings that contained arsenic-impacted subsurface soil deeper than 2 feet bgs at concentrations greater than 20 mg/kg with no vertical delineation samples stratigraphically above the exceedance were analyzed for arsenic to determine if arsenic impacts exist within surface soil.

2.1.2 Sample Collection

Prior to performing drilling and/or utility clearance work, a one-call utility mark-out was performed. The sample locations were marked-out by the onsite Data Management Services team using a global positioning system (GPS). Subsequently, the Parsons team and the Chevron Environmental Management Company (CEMC) Construction Manager

verified that the proposed sampling locations were cleared of underground utilities or other subsurface obstructions using site-specific knowledge and available as-built drawings.

Samples were collected by a licensed driller using hand augers and/or a direct-push drill rig. Soil from each 6-inch interval from 0 to 2 feet bgs was placed in a disposable bag and homogenized. Large rocks, vegetation, or debris were removed during the homogenizing process. Disposable samplers, bowls, and spoons were used (one-time use). Reusable equipment, including the hand augers and drill rods, were decontaminated between each sampling location/interval according to the CMI quality assurance project plan (QAPP) (Chevron 2016) decontamination procedures to prevent potential cross-contamination from the previous drilling location.

Visual observations (e.g., soil type, color, odor, staining, moisture), photoionization detector (PID) readings, and X-ray fluorescence (XRF) screening values were recorded on each boring log in 6-inch intervals. In situ soil concentrations for arsenic and lead using the XRF analyzer were recorded following the standard operating procedures for XRF. Soil samples were also classified and assigned a Unified Soil Classification System symbol.

2.1.3 Arsenic Sample Intervals

Soil samples were collected and analyzed for arsenic from varying 6-inch intervals from 0 to 2 feet bgs. Each soil boring was screened using a PID and XRF unit. Generally, the 6-inch sample interval was selected based on the following criteria:

- Depth interval with the highest XRF arsenic screening value
- Depth interval corresponding to the historical arsenic exceedance depth interval at an adjacent soil boring
- Depth interval based on similar soil type and/or soil color corresponding to the historical arsenic exceedance at an adjacent soil boring

2.1.4 Analytical Methods

Soil samples were collected in laboratory-provided bottles and placed on ice in a sample cooler. The sample identification, date, time, requested analytical parameter, and project-related information were recorded on the bottle label and on the chain-of-custody form provided by Eurofins Lancaster Laboratories. Samples collected from potentially impacted zones were analyzed by the laboratory for total arsenic. Quality control (QC) samples were collected per the QAPP guidelines (Chevron 2016). Total arsenic analysis was performed using USEPA SW-846 Method 6010B. The complete laboratory data packages are included in **Appendix B (on CD)**.

2.1.5 Data Validation

Analytical results for total arsenic were reviewed to determine the reliability of the data and assess any limitations on their use in support of project objectives. Sample results were reviewed and evaluated for compliance with holding times, surrogate recovery, internal standard results, and detection limits.

The data validation process involved the following:

- Review of the nonconformance summary included in each laboratory data package
- Evaluation of data quality using the Environmental Information Management (EIM) Database – Data Validation Module (DVM)
- Performance of data validation in accordance with the USEPA Region 2 standard operating procedures for organic and inorganic data review and in accordance with NJDEP Technical Guidance documents

Review of the nonconformance summaries included in the laboratory analytical data packages prepared by Eurofins Lancaster Laboratories, Inc. indicates that samples were received intact, sample holding times were met, and calibrations for each method were acceptable. The data validation performed by the DVM did not identify any data quality issues associated with the analytical results. The manual data validation performed by Parsons also did not identify any issues with data quality relating to precision, accuracy, representativeness, reproducibility, completeness, and sensitivity.

Based on the findings of the data validation performed on the laboratory analytical results for soil samples collected during the arsenic investigation in the Central Yard, the submitted data are reliable and defensible.

2.2 XRF Arsenic Correlation

As described in the 2013 Arsenic Cap FDR, a linear regression analysis was performed on the arsenic data to determine a field XRF concentration that would indicate with a high degree of confidence that the laboratory result on the same sample would be less than the target value of 20 mg/kg. Based on the analyses, a field XRF concentration of 16 parts per million (ppm) was the approved value that would indicate a high degree of confidence (i.e., at the 95% upper prediction limit) that the corresponding laboratory concentration would be less than 20 mg/kg.

Typically, samples were collected from the 6-inch interval within each boring yielding the highest XRF arsenic screening value and analyzed for total arsenic. If the results from this 6-inch interval showed arsenic concentrations below the CMI action level of 20 mg/kg, it was determined with high confidence that concentrations in the entire soil boring were below the CMI action level. Generally, this method was applied to both horizontal and vertical delineation samples.

Note: The arsenic XRF analysis is not to be used for the purpose of determining compliance with the Safe Drinking Water Act, the Water Pollution Control Act, the portion of the Radiation Protection Act governing radon and radon progeny, the Solid Waste Management Act, the Industrial Site Recovery Act, or the Spill Compensation and Control Act; any regulation or order issued pursuant to any of those statutes; or the USEPA's CERCLA Contract Laboratory Program.

3.0 ARSENIC-IMPACTED SOIL INVESTIGATIONS

The areas listed in Section 1.2 of this report were identified in the 2013 HSWA Permit Renewal as areas for which a containment cap was proposed, followed by filing a deed notice to address arsenic concentrations >20 mg/kg in surface soil. Figure 3 depicts the general location of each AOC, PAOC, SWMU, and arsenic investigation areas included in the 2013 Arsenic Cap FDR as it pertains to the rest of the Facility. The arsenic-impacted soil investigations at AOC 40 and SWMU 34 are described in Sections 3.1 and 3.2, respectively.

3.1 AOC 40

3.1.1 AOC 40 Background

AOC 40, formerly PAOC 30, consists of Tank Basin 22 within the Central Yard. The area is an approximately 0.85-acre tank basin along the eastern boundary of the Central Yard. The unit consists of aboveground storage tank (AST) 22, currently used for distillate storage, with a working capacity of 3,746,400 gallons. Historical aerial photography indicates that the former PAOC was part of a clay excavation pit prior to refinery construction. AST 22 was constructed in 1945 and put into service for crude oil storage. The tank was taken out of service in 1995 due to a leaking roof and was refurbished in 2000 to 2001 with a new cone roof and a double bottom with a leak detection system. An unknown quantity of sludge was removed from AST 22 in 1996 and again in 2000 as a result of tank cleaning activities.

Former PAOC 30 was investigated during the initial PAOC investigation in 2002. During this investigation, soil and groundwater samples were obtained from the unit. Although marginal polycyclic aromatic hydrocarbon (PAH) and arsenic exceedances were detected in soil samples, no volatile or semi-volatile exceedances were detected. Groundwater samples obtained from the boring location with PAH soil exceedances contained marginal exceedances of PAHs in addition to benzene (at 6 micrograms per liter [µg/L]). Since there were no exceedances of volatile or semi-volatile organic compounds (VOCs/SVOCs) above the Class IIA Groundwater Quality Standards (GWQS) in the remaining groundwater samples, an NFA for groundwater was recommended in the CMS. Based on the marginal soil exceedances within the unit, Chevron recommended this unit be added to the HSWA Permit in the PAOC RIR. Subsequently, PAOC 30 was added to the 2013 HSWA Permit Renewal as AOC 40 and addressed under the CMI.

The 2013 HSWA Permit Renewal approved the following CMs to address impacts in AOC 40:

- Filing of a deed notice for BaP concentrations < 10 mg/kg and >0.66 mg/kg;
- Containment consisting of a cap with subsequent filing of a deed notice for arsenic concentrations > 20 mg/kg in surface soil; and
- Further evaluation of groundwater.

The 2013 HSWA Permit Renewal recommended capping and subsequent filing of a deed notice to address arsenic-impacted surface soil in AOC 40 based on samples collected during the PAOC remedial investigation (Chevron 2014). The 2013 Arsenic Cap FDR associate's area AS-MY10 with AOC 40 (**Figure 4**).

3.1.2 Arsenic in Surface Soil Investigations

Three soil borings (S0888, S0889, and S0890) were advanced within former PAOC 30 (AOC 40) (**Figure 4**) in 2002 during the PAOC remedial investigation. Soil samples were collected at depth intervals ranging from 0.5 to 5.5 feet bgs and analyzed for arsenic. Results showed that arsenic was detected below the CMI action limit of 20 mg/kg in samples collected from borings S0889 and S0890 at depth intervals of 5 to 5.5 feet bgs and 0.5 to 1 feet bgs, respectively (**Table 1**). Arsenic was detected above the CMI action level in the sample collected from soil boring S0888 at a concentration of 35.3 mg/kg from depth interval 5 to 5.5 feet bgs.

In 2003, soil boring S1400 was advanced within AOC 40 (**Figure 4**) during the Full RFI. A soil sample was collected from depth interval 2 to 2.5 feet bgs and analyzed for arsenic. Results showed that arsenic concentrations were below the CMI action level of 20 mg/kg from the analyzed sample interval.

In 2012, soil boring S2929 was collocated with S0888 during the Phase I Arsenic Cap Investigation to complete vertical delineation of arsenic-impacted soil. This boring was advanced, sampled, and analyzed for arsenic in surface soil. Arsenic was detected at a concentration of 5.74 mg/kg from sampling depth interval 1.5 to 2 feet bgs. This investigation completed delineation of arsenic-impacted subsurface soil detected in boring S0888.

3.1.3 Investigation Results

As described in Section 6.5 of the 2013 Arsenic Cap FDR, AS-MY10 contained arsenic concentrations greater than 20 mg/kg in subsurface soil, but less than 20 mg/kg in surface soil (0 to 2 feet bgs). The 2013 Arsenic Cap FDR recommended NFA for arsenic in surface soil at AS-MY10 (AOC 40) which was subsequently approved by the NJDEP in a letter dated June 4, 2014. Arsenic-impacted soil greater than the CMI action level of 20 mg/kg at depths below 2 feet bgs is determined to be sufficiently capped and is included in the Central Yard Draft Deed Notice (Chevron 2019).

3.2 **SWMU 34**

3.2.1 SWMU 34 Background

SWMU 34 is in the southeast portion of the Facility's Central Yard and was first identified as a dumpster loading/unloading platform and drum/dumpster staging area. The soil investigation in this area of the Facility began in 1995 with implementation of the 1st Phase RFI (Chevron 1997). Potentially contaminated soil was encountered near the historical dumpster platform and the drum/dumpster staging area. These areas were designated as SWMU 34 for investigation as part of the 1st Phase RFI. The 1st Phase RFI results

indicated that additional sampling was necessary to fully characterize soil conditions in SWMU 34.

The additional investigation began in 2002 as part of the Full RFI (Chevron 2003). Although SWMU 34 was originally identified in the 1st Phase RFI based on the area of potentially contaminated soil near the historical dumpster platform and the drum/dumpster staging areas, SWMU 34 was extended west, east, and southeast of these areas based on results from the Full RFI. The Full RFI recommended that SWMU 34 soil and groundwater be evaluated during the CMS.

The Former Asphalt Railcar Rack in the southeast corner of the Facility's Central Yard was designated as PAOC 89 and investigated during the PAOC site investigation in 2002 (performed concurrently with the Full RFI) and during the supplemental PAOC investigation performed in 2009. PAOC 89 was also investigated during the PAOC remedial investigation initiated in 2012. The PAOC 89 investigation results were presented in the PAOC Remedial Investigation Report (Chevron 2014). This report indicated that VOCs, SVOCs, and metals were detected in PAOC 89 soil at concentrations greater than the most stringent NJ RDCSRS. VOCs and metals were also detected in PAOC 89 groundwater at concentrations greater than the NJDEP GWQS. PAOC 89 is within the boundaries of SWMU 34, therefore the constituents of concern identified in PAOC 89 soil were attributed to SWMU 34 and will be addressed under the CMI for that unit. PAOC 88 and PAOC 89 were recommended for Response Action Outcome (RAO) and accepted by the NJDEP as per comment letter dated February 24, 2016. PAOC 88 contains contaminants present in soils attributed to historic fill material and will be addressed under the new ISRA¹ AOC: Site-Wide Historic Fill Material- Soil.

The CMS PDI was implemented in 2007 to provide additional data to determine the extent of impacts identified during previous investigations. The CMS PDI confirmed the presence of soil and groundwater impacts in the area surrounding the historical dumpster platform and the drum/dumpster staging areas. The CMS report identified SWMU 34 as an area requiring remediation to address the lead-impacted soil and groundwater, BaP-impacted soil, and arsenic-impacted surface soil. The 2013 HSWA Permit Renewal approved the following CMs to address impacts in SWMU 34:

- ESS and disposal in the Facility's Corrective Action Management Unit (CAMU) for Toxicity Characteristic Leaching Procedure (TCLP) lead levels > 5 milligrams per liter (mg/L) and BaP > 10 mg/kg in soil;
- ISS for TCLP lead levels < 5 mg/L, lead levels > 800 mg/kg in soil, and lead concentrations > 50 µg/L in groundwater and subsequent filing of a deed notice;
- Containment consisting of constructing a cap and subsequent filing of a deed notice for arsenic concentrations > 20 mg/kg in surface soil;
- Filing of a deed notice for soils with BaP concentrations < 10 mg/kg and > 0.66 mg/kg; and

¹ ISRA – NJDEP Industrial Site Recovery Act

- Monitored natural attenuation and filing a Classification Exception Area for groundwater.

As part of the CMI, a PDI was performed in 2013 to define the extent of soil contamination within SWMU 34. In 2013 and 2014, Buckeye Perth Amboy Terminal LLC (Buckeye), the Facility owner, constructed a ladder track system consisting of a loading rack and associated railways throughout SWMU 34. The ladder track system is used for loading and off-loading petroleum products into and off tank railcars. The ladder track system consists of sub-ballast, ballast, railroad tracks, and associated infrastructure. The system was constructed over-top of the existing ground surface in SWMU 34 and serves as a cap (i.e., physical barrier) to limit the potential for dermal exposure to and migration of the underlying impacted soil. Installation of the ladder track system involved the construction of the following elements:

- Seven rail spurs were installed oriented north-south that connect to the existing Conrail tracks.
- At least 14 inches of ballast and sub-ballast were placed over the existing ground surface.
- Tank car unloading platforms were constructed. The platforms included concrete footers to support the platform structures and are approximately 10 feet long by 6 feet wide to a depth of approximately 4 feet below the existing ground surface.
- An underdrain system with associated rail pan drain/collection piping and sumps was installed. The rain pan collection sumps are approximately 10 feet long by 10 feet wide.
- A product off-loading system was constructed and consisted of a reinforced concrete pump pad. The off-loading system also included both above grade and below grade piping.

The redeveloped ladder track rail system impeded the CM for impacted soils in SWMU 34. Therefore, a subsurface permeable reactive barrier (PRB) wall was constructed in 2013 and 2014 as an interim CM to prevent migration of potential lead impacts in groundwater downgradient of the lead impacted soil at SWMU 34. The PRB CM was detailed in the approved interim CM implementation work plan (IWP) for SWMU 34 (Chevron 2013c) and Interim CM SWMU 34 Construction Completion Report (CCR) (Chevron 2015). NJDEP provided comments on the SWMU 34 PRB CCR in a letter dated December 19, 2016. Response to NJDEP comments on Chevron's SWMU 34 PRB Wall CCR were submitted to NJDEP on June 12, 2017. NJDEP approved the SWMU 34 PRB CCR and response to comments on July 28, 2017.

The ESS IWP for SWMU 34 to address lead-impacts was submitted to USEPA and NJDEP for approval on December 12, 2017. USEPA and NJDEP provided comments on the ESS IWP in a letter dated May 14, 2018. On October 25, 2018, a revised SWMU 34 IWP was submitted to USEPA and NJDEP in response to the May 14, 2018 comment letter. USEPA and NJDEP provided comments on the revised SWMU 34 ESS IWP in a letter dated February 8, 2019. Chevron's response to USEPA and NJDEP comments on the revised SWMU 34 ESS IWP was submitted on April 16, 2019.

AOC 22 (Shops Building Groundwater Contamination) and AOC 36 (Chlorinated Hydrocarbons in Groundwater) are also located within the expanded boundaries of SWMU 34. These units were included in the 2013 HSWA Permit Renewal to be addressed by the SWMU 34 CMI. Benzene-impacted soil in AOC 22 was delineated and excavated for off-site disposal in 2013. Benzene concentrations in groundwater in AOC 22 will be evaluated in 2019 to determine if ISCO remediation will be required. In 2018, AOC 36 groundwater impacts were addressed with enhanced in-situ bioremediation (EISB).

Although construction of the ladder track system and placement of railroad ballast and sub-ballast will serve as a cap to mitigate dermal contact and/or migration of contaminated soils, it will not preclude the implementation of in situ technologies, if necessary, to address benzene-impacted groundwater in AOC 22, chlorinated hydrocarbon-impacted groundwater in AOC 36, and benzene-impacted soil and groundwater in the southern portion of SWMU 34.

The 2013 HSWA Permit Renewal recommended capping and subsequent filing of a deed notice to address arsenic-impacted surface soil; however, the 2013 Arsenic Cap FDR did not associate an investigation area with SWMU 34.

3.2.2 Arsenic in Surface Soil Investigations

The 1st Phase RFI focused on the historical dumpster platform and drum/dumpster staging areas within SWMU 34. In 1995 and 1996, nine soil borings (SB-0142, SB-0143, SB-0148 through SB-0150, and SB-0176 through SB-0179) were advanced during the 1st Phase RFI within and near the area suspected of residual petroleum contamination in soil. Soil samples were collected at depths ranging from 2 to 10 feet bgs and analyzed for arsenic. Results showed arsenic concentrations below the CMI action level of 20 mg/kg in all soil samples collected during this investigation (**Figure 5**).

In 2002 and 2003, 14 soil borings (S0726 to S0729, S0733, S1393, S1394, S1396 to S1398, and S1431 through S1434) were advanced within SWMU 34 during the Full RFI and analyzed for arsenic. Arsenic was detected above the CMI action level of 20 mg/kg in soil borings S0727, S0729, S1394, S1396 to S1398, and S1432 at depths ranging from 10.5 to 21.0 feet bgs (**Table 2**). During this investigation, arsenic-impacted subsurface soil was vertically delineated stratigraphically above the exceedances detected in borings S0727, S0729, S1397, and S1398. This vertical delineation sampling confirmed arsenic-impacted surface soil does not extend to surface soil at these boring locations. Subsurface soil exceedances detected within borings S1394, S1396, and S1432 were not vertically delineated during this investigation (**Figure 5**).

During the PAOC remedial investigation in 2002, soil borings S0905 and S0911 through S0913 were advanced and analyzed for arsenic within or near SWMU 34 (**Figure 5**). Arsenic-impacted subsurface soil was detected in boring S0913 from depth interval 15 to 15.5 feet bgs. Soil borings S0905, S0911, and S0912 showed arsenic levels below the CMI action level of 20 mg/kg.

In 2012 and 2013, concurrently with the EISB and ESS/ISS PDIs to delineate impacted soil and groundwater, samples were analyzed for arsenic to further delineate arsenic-

impacted soil within SWMU 34 (**Figure 5**). Soil samples were collected and analyzed for arsenic at depth intervals ranging from 0 to 30.5 feet bgs. During this investigation, nine soil borings contained arsenic concentrations above the CMI action level of 20 mg/kg in surface soil (S3802, S3847, S3885, S3889, S4090, S4098, S4129, S4134, and S4138) (**Table 2**). Soil borings S3779, S3780, S3782, S3786, S3795, S3804, S3841, S3890, S4093, S4097, S4143, S4145, and S4148 showed arsenic concentrations below the CMI action level of 20 mg/kg in surface soil. Soil borings S3801, S3806, S4140, S4144, and S4146 were advanced during this investigation, and arsenic was analyzed from 6-inch depth intervals that displayed XRF arsenic screening values greater than the arsenic screening values detected in surface soil (0 to 2 feet bgs). Arsenic concentrations from samples collected from soil borings S3801, S3806, S4140, S4144, and S4146 were below the CMI action level of 20 mg/kg. Soil boring S4099 was also advanced during this investigation; however, no arsenic analysis was performed. The arsenic XRF screening values from boring S4099 indicated no detection of arsenic from 0 to 1.5 feet bgs and a value of 14 ppm from 1.5 to 2 feet bgs. As described in Section 2.2 of this report, an XRF concentration of 16 ppm or less indicates with a high degree of confidence that the laboratory result on the same sample would be less than the target value of 20 mg/kg. Therefore, soil boring S4099 is considered to contain arsenic concentrations below the CMI action level. The boring log and associated XRF screening values are included in **Appendix A**. Additionally, the soil sample collected from boring S4097 (located approximately 50 feet east of S4099) within the 1.0- to 1.5-foot bgs interval exhibited an arsenic concentration of 14.4 mg/kg.

During the PAOC remedial investigation in 2013, soil borings S2754, S2814, S2831, and S2856 were advanced and analyzed for arsenic along the western boundary of SWMU 34 (**Figure 5**). Arsenic-impacted surface soil was detected in the sample collected from soil boring S2814 at a concentration of 30.7 mg/kg from depth interval 0.5 to 1 foot bgs. Soil borings S2754, S2831, and S2856 were located northwest, west, and southwest of boring S2814. Arsenic concentrations were below the CMI action level of 20 mg/kg in surface soil collected from these borings. Following this environmental investigation, Buckeye constructed the ladder track system on top of the arsenic-impacted surface soil that was detected during the Full RFI, PAOC remedial investigation, and 2012/2013 PDI.

A supplemental PDI was performed from 2016 through 2018 to complete delineation of arsenic and lead impacts within SWMU 34 (**Figure 5**). Soil borings S5413, S5474, and S5488 were advanced and analyzed for arsenic. Soil boring S5413 was sampled from depth intervals ranging from 20.5 to 30.5 feet bgs. Both soil borings S5474 and S5488 were sampled from a depth interval of 1 to 1.5 feet bgs. Results showed arsenic concentrations were below the CMI action level of 20 mg/kg from the soil borings. Soil boring S5475 was also advanced during this investigation; however, no arsenic analysis was performed. The arsenic XRF screening values from boring S5475 indicated no detection of arsenic throughout the boring from 0 to 10.5 feet bgs, with one XRF arsenic detection of 13 ppm from depth interval 10.5 to 11 feet bgs. Soil boring S5475 was collocated with historical S1434 which was analyzed for arsenic from depth intervals 14 to 14.5 feet bgs and 14.5 to 15 feet bgs. Both samples were below the CMI action level of

20 mg/kg. As described in Section 2.2 of this report, an XRF concentration of 16 ppm or less indicates with a high degree of confidence that the laboratory result on the same sample would be less than the target value of 20 mg/kg. Therefore, soil boring S5475 is considered to contain arsenic concentrations below the CMI action level of 20 mg/kg. The boring log and associated XRF screening values are included in **Appendix A**.

Boring S5836 was advanced to the west of boring S4098 (**Figure 5**) in 2019 to complete southwestern delineation of arsenic-impacted surface soil around SWMU 34. Results showed arsenic concentrations below the CMI action level of 20 mg/kg from depth interval 1.5 to 2 feet bgs.

Arsenic-impacted surface soil has been delineated by borings S2754, S2831, S2856, S4140, S4144, S4145, S4146, S5488, and S5836 to the west; borings S0733, S3261, S4140, S4143, and S4148 to the north; borings S3270, S3801, S3806, S5474, and S5475 to the east; and borings S4093, S4097, S4099, and S5836 to the south (**Figure 5**). As noted in the boring logs (**Appendix A**), borings S3261 and S3270 were advanced in 2013 and contained gravel and cobbles from 0 to 2 feet bgs. These borings did not contain arsenic-impacted surface soil prior to the installation of the ladder track system and are considered clean delineation samples to the north and east.

3.2.3 Investigation Results

Arsenic-impacted soil in SWMU 34 is indicative of historic fill material deposited to raise the topographic elevation of the site. This material was most likely impacted prior to emplacement and is not connected with the operations at the location of emplacement.

Arsenic-impacted soil greater than the CMI action limit of 20 mg/kg at a depth below 2 feet bgs at SWMU 34 is determined to be sufficiently capped and was included in the Central Yard Draft Deed Notice. Arsenic impacted surface soil has been delineated by borings S2754, S2831, S2856, S4140, S4144, S4145, S4146, S5488, and S5836 to the west; S0733, S3261, S4140, S4143, and S4148 to the north; S3270, S3801, S3806, S5474, and S5475 to the east; and S4093, S4097, S4099, and S5836 to the south (**Figure 5**). The arsenic-impacted soil is capped below the existing tracks, footings, foundations, containment systems, and 14-inch-thick layer of ballast and sub-ballast which satisfies the contact cap requirements outlined in Section 6.4 of the 2013 Arsenic Cap FDR. No adverse impacts are anticipated from using the ladder track system as a cap, and there are no planned changes for the use of this area in the future.

The majority of arsenic impacts are located within the ladder track system cap area. A limited portion of arsenic-impacted surface soil is present along the eastern boundary of SWMU 34, between the ladder track system cap area and the property boundary as indicated from soil borings S3802 and S3885 (**Figure 5**). The arsenic-impacted surface soil detected in borings S3802 and S3885 is bound by clean borings S1434 and S5475 to the north, and S3806 to the south. The former tank car loading rack asphalt foundation and surrounding gravel cover in this area will serve as a cap to prevent direct contact and exposure to the underlying arsenic-impacted soil up to the property boundary as shown on **Figure 5**. Typical construction of asphalt pavement throughout the Facility includes

approximately 6 inches of dense quarry aggregate sub-base and approximately 5 inches of bituminous base course, held in place by 2 inches of bituminous surface course. The former tank car loading rack asphalt foundation satisfies the contact cap requirements outlined in Section 6.4 of the 2013 Arsenic Cap FDR.

SWMU 34 stratigraphy indicates arsenic-impacted soil is limited to the fill material placed over the native soil. It is also noted that the Conrail tracks located on the east side of SWMU 34 have been in use since the 1870s. During this time, the ground surface elevations around SWMU 34 ranged from approximately 20 feet above mean seal level (MSL) in the northern portion of SWMU 34 to approximately 10 feet MSL to the south. This is consistent with the depth to native material observed on the boring logs. Later topographic maps depict the SWMU 34 area as being relatively flat with a surface elevation ranging between 30 and 35 feet MSL, indicating the area was filled to raise the grade. Since the Conrail tracks were in place prior to the development of the Facility for industrial use, it is unlikely that fill material placed on the Facility extends eastward beyond the railroad tracks. Per the NJDEP's Historic Fill Technical Guidance document (NJDEP 2013), it is not necessary to delineate historic fill material beyond the property boundary. Therefore, step-out soil sampling was not performed to complete eastern delineation of arsenic-impacted soil detected in borings S3802 and S3885.

Arsenic-impacted soil greater than the CMI action level of 20 mg/kg at depths below 2 feet bgs is determined to be sufficiently capped and was included in the Central Yard Draft Deed Notice (Chevron 2019). Chevron requests review and approval by the NJDEP and USEPA for an NFA determination for arsenic in surface soil in SWMU 34.

4.0 PAOC REMEDIAL INVESTIGATION RESULTS

Soil exceedances in the Facility's Central Yard were evaluated during the PAOC remedial investigation, and findings were summarized in the PAOC Remedial Investigation Report (Chevron 2014). As presented in a letter to the NJDEP dated July 12, 2002, Chevron identified 95 units of potential environmental concern at the former Chevron Perth Amboy Refinery and designated these units PAOCs (**Figure 3**). These PAOCs were identified using the information obtained from the site assessment completed for Chevron's 1994 HSWA Permit. Chevron generated a list of these units, plotted them on a map, and submitted this information to the NJDEP. These PAOCs include manifolds, tanks, process units, and loading racks that were not already identified on Chevron's active HSWA Permit. In meetings with NJDEP and the USEPA, Chevron voluntarily agreed to conduct an evaluation of the PAOCs. Since PAOCs are not covered under the HSWA Permit, this investigation was conducted under the oversight of NJDEP. In 2012, Chevron sold the majority of the remaining three yards, approximately 232 acres, to Buckeye, which initiated NJDEP ISRA requirements such as the submittal of the PAOC Remedial Investigation Report.

It was concluded in the PAOC Remedial Investigation Report that contaminants present in soil (including arsenic) within PAOCs are attributed to historic fill material and will be addressed under the new ISRA AOC: Site-Wide Historic Fill Material – Soil. Under the 2013 HSWA Permit Renewal, the CMI will address arsenic-impacted surface soil greater than 20 mg/kg associated with AOCs and SWMUs outlined in the permit (AOC 40 and SWMU 34). Once the CMI is complete, a single Remedial Action Work Plan for the Central Yard to address HFM will be submitted to NJDEP to seek a Response Action Plan (RAP)/RAO for the entire site.

5.0 INSTITUTIONAL CONTROLS

Chevron submitted a Draft Deed Notice for the Central Yard of the Facility to the NJDEP and USEPA on February 27, 2019 pursuant to the New Jersey Administrative Code (N.J.A.C.) 7:26E-8.2 to address contaminants of concern in soils that remain above their respective New Jersey Residential Direct Contact Soil Remediation Standards (Chevron 2019). Upon review and approval of the Central Yard Draft Deed Notice, it will be filed with the County of Middlesex, NJ. Once the deed notice is approved, it is anticipated the USEPA will issue a CA 550 determination (certification of remedy completion or construction completion).

6.0 CONCLUSIONS AND RECOMMENDATIONS

As described in Section 3.1.3 of this report, AOC 40 was approved for NFA by the NJDEP in a letter dated June 4, 2014 for arsenic in surface soil. Chevron recommends NFA for arsenic in surface soil at SWMU 34 within the Central Yard of the Former Chevron Perth Amboy Facility as described in Section 3.2. In accordance with the 2013 Arsenic Cap FDR and HSWA Permit Renewal, arsenic impacted surface soil has been addressed by the existing cap. This existing ladder track system and former tank car loading rack will isolate the contaminants in soil beneath the cap, which will mitigate the potential for exposure to the contaminated material. The ladder track cap and former tank car loading rack will limit the potential for dermal exposure to impacted soils and the potential for impacted soils to migrate beyond the limits of SWMU 34, thus being protective of human health and the environment. Arsenic-impacted soil greater than the CMI action level of 20 mg/kg at depths below 2 feet bgs is determined to be sufficiently capped and was included in the Central Yard Draft Deed Notice (Chevron 2019).

7.0 REFERENCES

- Chevron. 1997. 1st-Phase RCRA Facility Investigation Soils Report RCRA Corrective Action Module #1. January.
- Chevron. 2003. Full RCRA Facility Investigation (RFI) Report, November.
- Chevron, 2008a. Supplemental RCRA RFI Report. February.
- Chevron. 2008b. Corrective Measures Study (CMS) Report for the Main Yard, East Yard and Central Yard. Prepared by URS Corporation. November.
- Chevron, 2013a. Final Design Report (FDR) Arsenic Cap, East, Main, and Central Yards. May
- Chevron, 2013b. Final HSWA Permit Renewal and Permit Modifications I. July
- Chevron, 2013c. Interim Corrective Measure Implementation Work Plan for SWMU 34.
- Chevron, 2014. PAOC Remedial Investigation Report (RIR), May.
- Chevron, 2015. Interim Corrective Measure Construction Completion Report for SWMU 34.
- Chevron. 2016. Perth Amboy Facility Corrective Measures Implementation Sampling and Analysis Plan/Quality Assurance Project Plan (FSAP-QAPP). Prepared by Parsons. March.
- Chevron. 2019. Central Yard Draft Deed Notice. February.
- NJDEP. 2013. Site Remediation Program: Historic Fill Technical Guidance. April.

TABLES

Table 1
AOC 40 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S0888	S0889	S0890	S1400	S2929
Field Sample ID				S0888C3	S0889C3	S0890A2	S1400B1	S2929A4
Sample Date				11/22/2002	11/22/2002	11/22/2002	01/09/2003	10/11/2012
Start Depth - End Depth				5 - 5.5	5 - 5.5	0.5 - 1	2 - 2.5	1.5 - 2
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached	20.0 mg/kg	Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N		35.3	7.4	10.7	13	5.74

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	SB-0142	SB-0143	SB-0148	SB-0149	SB-0150
Field Sample ID				SB-0142S-B	SB-0143S-C	SB-0148S-D	SB-0149S-C	SB-0150S-C
Start Depth - End Depth				2 - 4	4 - 6	6 - 8	4 - 6	4 - 6
Sample Date				12/01/1995	12/04/1995	12/06/1995	12/06/1995	12/06/1995
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	9.8	14.1	10.3	9.7	11.6

Location ID			CMI Soil Action Level	SB-0176	SB-0177	SB-0178	SB-0179	S0726
Field Sample ID				SB-0176S-B	SB-0177S-E	SB-0178S-E	SB-0179S-A	S0726A2
Start Depth - End Depth				2 - 4	8 - 10	8 - 10	2 - 2	0.5 - 1
Sample Date				01/30/1996	01/30/1996	01/30/1996	01/30/1996	07/24/2002
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached	CMI Soil Action Level	Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	3.9	10.6	9.4	12.2	10.1

Location ID			CMI Soil Action Level	S0726	S0726	S0727	S0727	S0727
Field Sample ID				S0726G2	S0726I4	S0727A3	S0727H3	S0727J4
Start Depth - End Depth				12.5 - 13	17.5 - 18	1 - 1.5	15.0 - 15.5	19.5 - 20.0
Sample Date				07/24/2002	07/24/2002	07/24/2002	07/24/2002	07/24/2002
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	16.5	8.29	10.9	34.3	4.11

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S0728	S0728	S0728	S0729	S0729
Field Sample ID				S0728A3	S0728G3	S0728J4	S0729A4	S0729E2
Start Depth - End Depth				1 - 1.5	13 - 13.5	19.5 - 20	1.5 - 2	8.5 - 9
Sample Date				07/24/2002	07/24/2002	07/24/2002	07/24/2002	07/24/2002
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	17.1	15.5	6.22	17.5	10.6

Location ID			CMI Soil Action Level	S0729	S0733	S0733	S0733	S0905
Field Sample ID				S0729I3	S0733A2	S0733E1	S0733G2	S0905E1
Start Depth - End Depth				17 - 17.5	0.5 - 1	8.0 - 8.5	12.5 - 13.0	8 - 8.5
Sample Date				07/24/2002	07/08/2002	07/08/2002	07/08/2002	11/22/2002
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached	CMI Soil Action Level	Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	22.4	12.2	5.57	5.55	11.8

Location ID			CMI Soil Action Level	S0911	S0912	S0913	S1393	S1393
Field Sample ID				S0911C1	S0912F4	S0913H3	S1393F4	S1393H3
Start Depth - End Depth				4 - 4.5	11.5 - 12	15 - 15.5	11.5 - 12	15 - 15.5
Sample Date				11/22/2002	11/22/2002	11/22/2002	01/07/2003	01/07/2003
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached	CMI Soil Action Level	Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	3.7	3.0	29.5	8.0	6.4

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S1394	S1394	S1396	S1396	S1397
Field Sample ID				S1394I2	S1394J4	S1396I3	S1396K2	S1397F2
Start Depth - End Depth				16.5 - 17	19.5 - 20	17 - 17.5	20.5 - 21	10.5 - 11
Sample Date				01/06/2003	01/06/2003	01/06/2003	01/06/2003	01/07/2003
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	21.2	29.3	34.8	35.4	13.6

Location ID			CMI Soil Action Level	S1397	S1398	S1398	S1431	S1431
Field Sample ID				S1397I2	S1398B2	S1398H4	S1431E4	S1431F1
Start Depth - End Depth				16.5 - 17	2.5 - 3	15.5 - 16	9.5 - 10	10 - 10.5
Sample Date				01/07/2003	01/07/2003	01/07/2003	02/03/2003	02/03/2003
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	25.2	13.2	24.1	1.4	2.3

Location ID			CMI Soil Action Level	S1432	S1432	S1432	S1433	S1433
Field Sample ID				S1432F2	S1432G4	S1432J3	S1433H4	S1433I1
Start Depth - End Depth				10.5 - 11	13.5 - 14	19 - 19.5	15.5 - 16	16 - 16.5
Sample Date				02/05/2003	02/05/2003	02/05/2003	02/03/2003	02/03/2003
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	43.4	10.6	1.9	13.3	3.6

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S1434	S1434	S2651	S2653	S2653
Field Sample ID				S1434H1	S1434H2	S2651D3	S2653L1	S2653P3
Sample Date				14 - 14.5	14.5 - 15	7 - 7.5	22 - 22.5	31 - 31.5
Start Depth - End Depth				02/05/2003	02/05/2003	03/27/2012	03/26/2012	03/26/2012
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	2.4	2.3	3.88	1.98 J	4.06

Location ID			CMI Soil Action Level	S2654	S2655	S2655	S2657	S2658
Field Sample ID				S2654L1	D0327123	S2655I1	S2657I1	S2658K2
Sample Date				22 - 22.5	16 - 16.5	16 - 16.5	16 - 16.5	20.5 - 21
Start Depth - End Depth				03/27/2012	03/27/2012	03/27/2012	03/27/2012	03/27/2012
Sample Purpose				REG	FD	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	3.96	5.15	3.27	2.04 J	2.39

Location ID			CMI Soil Action Level	S2754	S2754	S2754	S2814	S2814
Field Sample ID				S2754A2	S2754B4	S2754F1	S2814A2	S2814D1
Sample Date				0.5 - 1	3.5 - 4	10 - 10.5	0.5 - 1	6 - 6.5
Start Depth - End Depth				04/25/2013	04/25/2013	04/25/2013	04/11/2013	04/11/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	1.08 J	10.7	20.6	30.7	4.80

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S2814	S2831	S2831	S2831	S2831
Field Sample ID				S2814F1	S2831A3	S2831C3	S2831E1	S2831F1
Sample Date				10 - 10.5	1 - 1.5	5 - 5.5	8 - 8.5	10 - 10.5
Start Depth - End Depth				04/11/2013	04/25/2013	04/25/2013	04/25/2013	04/25/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	12.6	8.2	11.1	36.1	5.3

Location ID			CMI Soil Action Level	S2856	S2856	S2856	S2856	S2856
Field Sample ID				S2856A2	S2856A3	S2856D1	S2856E3	S2856G3
Sample Date				0.5 - 1	1 - 1.5	6 - 6.5	9 - 9.5	13 - 13.5
Start Depth - End Depth				04/11/2013	04/11/2013	04/11/2013	04/11/2013	04/11/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	0.362 U	18.5	12.9	20.1	2.47

Location ID			CMI Soil Action Level	S3261	S3265	S3267	S3267	S3269
Field Sample ID				S3261K3	S3265L3	S3267H1	S3267I3	S3269K3
Sample Date				21 - 21.5	23 - 23.5	14 - 14.5	17 - 17.5	21 - 21.5
Start Depth - End Depth				04/08/2013	03/04/2013	03/05/2013	03/05/2013	03/05/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	1.21 J	4.40	2.22 J-	2.64 J-	1.35 J

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3270	S3273	S3273	S3274	S3276
Field Sample ID				S3270G4	D0409135	S3273M3	S3274M1	S3276N1
Sample Date				13.5 - 14	25 - 25.5	25 - 25.5	24 - 24.5	26 - 26.5
Start Depth - End Depth				04/08/2013	04/09/2013	04/09/2013	04/09/2013	04/09/2013
Sample Purpose				REG	FD	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	2.45	0.384 U	0.387 U	2.21 U	0.418 U

Location ID			CMI Soil Action Level	S3277	S3278	S3278	S3279	S3779
Field Sample ID				S3277M2	S3278N1	S3278P1	S3279N3	S3779A2
Sample Date				24.5 - 25	26 - 26.5	30 - 30.5	27 - 27.5	0.5 - 1
Start Depth - End Depth				04/10/2013	04/11/2013	04/11/2013	04/10/2013	06/20/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	1.66 J	1.21 J	6.10	16.8	15.7 J

Location ID			CMI Soil Action Level	S3779	S3780	S3780	S3781	S3782
Field Sample ID				S3779G3	S3780A2	S3780G2	S3781R1G3	S3782A2
Sample Date				13 - 13.5	0.5 - 1	12.5 - 13	13 - 13.5	0.5 - 1
Start Depth - End Depth				06/20/2013	06/18/2013	06/18/2013	09/13/2013	06/20/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	39.0	8.98	21.1	7.95	16.3

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3782	S3784	S3784	S3785	S3786
Field Sample ID				S3782H2	S3784A2	S3784RH3	S3785R1H3	S3786A2
Start Depth - End Depth				14.5 - 15	0.5 - 1	15 - 15.5	15 - 15.5	0.5 - 1
Sample Date				06/20/2013	06/19/2013	06/19/2013	07/12/2013	06/21/2013
Sample Purpose				REG	REG	REG	RE	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	9.17 U	6.02	10.4	6.07	11.8

Location ID			CMI Soil Action Level	S3786	S3786	S3786	S3787	S3787
Field Sample ID				S3786B4	S3786D4	S3786H3	D0621139	S3787G2
Start Depth - End Depth				3.5 - 4	7.5 - 8	15 - 15.5	12.5 - 13	12.5 - 13
Sample Date				06/21/2013	06/21/2013	06/21/2013	06/21/2013	06/21/2013
Sample Purpose				REG	REG	REG	FD	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	14.5	13.2	6.77	12.4	25.0

Location ID			CMI Soil Action Level	S3787	S3787	S3788	S3788	S3788
Field Sample ID				S3787H1	S3787I1	S3788B1	S3788J1	S3788K1
Start Depth - End Depth				14 - 14.5	16 - 16.5	2 - 2.5	18 - 18.5	20 - 20.5
Sample Date				06/21/2013	06/21/2013	06/24/2013	06/24/2013	06/24/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	2.61	9.96	51.8	3.28	58.8

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3789	S3789	S3789	S3791	S3791
Field Sample ID				S3789D3	S3789J1	S3789K3	S3791R1G1	S3791R2C4
Start Depth - End Depth				7 - 7.5	18 - 18.5	21 - 21.5	12 - 12.5	5.5 - 6
Sample Date				06/25/2013	06/25/2013	06/25/2013	06/27/2013	06/27/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	17.0	10.2	72.7	8.48	17.4

Location ID			CMI Soil Action Level	S3792	S3793	S3794	S3794	S3795
Field Sample ID				S3792R2G3	S3793J1	S3794I3	S3794J2	S3795A2
Start Depth - End Depth				13 - 13.5	18 - 18.5	17 - 17.5	18.5 - 19	0.5 - 1
Sample Date				09/13/2013	06/28/2013	06/28/2013	06/28/2013	07/01/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	35.3	5.46	7.98	56.9	12.0

Location ID			CMI Soil Action Level	S3795	S3796	S3797	S3797	S3798
Field Sample ID				S3795I4	S3796R1I3	S3797F3	S3797J3	S3798J1
Start Depth - End Depth				17.5 - 18	17 - 17.5	11 - 11.5	19 - 19.5	18 - 18.5
Sample Date				07/01/2013	07/02/2013	07/03/2013	07/03/2013	07/03/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	2.93	6.91	11.3	4.62	5.50

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3799	S3799	S3799	S3800	S3801
Field Sample ID				S3799G3	S3799I2	S3799J1	S3800H3	S3801F2
Start Depth - End Depth				13 - 13.5	16.5 - 17	18 - 18.5	15 - 15.5	7/9/2013
Sample Date				07/08/2013	07/08/2013	07/08/2013	07/09/2013	10.5 - 11
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	30.9	5.56	39.2	6.47	18.2

Location ID			CMI Soil Action Level	S3802	S3802	S3802	S3802	S3803
Field Sample ID				S3802A2	S3802A4	S3802C3	S3802D4	S3803F2
Start Depth - End Depth				0.5 - 1	1.5 - 2	5.5 - 6	7.5 - 8	10.5 - 11
Sample Date				07/10/2013	07/10/2013	07/10/2013	07/10/2013	07/10/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	22.5	23.5	72.4	92.7	3.8 U

Location ID			CMI Soil Action Level	S3804	S3804	S3804	S3806	S3807
Field Sample ID				D0711139	S3804A3	S3804R1I3	S3806C3	S3807I1
Start Depth - End Depth				1 - 1.5	1 - 1.5	17 - 17.5	5 - 5.5	16 - 16.5
Sample Date				07/11/2013	07/11/2013	07/11/2013	07/16/2013	07/16/2013
Sample Purpose				FD	REG	RE	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	3.73	17.4	4.14	12.9	13.6

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3836	S3838	S3840	S3841	S3843
Field Sample ID				S3836R1H1	S3838G4	S3840H1	S3841A1	S3843G2
Start Depth - End Depth				14 - 14.5	13.5 - 14	14 - 14.5	0 - 0.5	12.5 - 13
Sample Date				07/17/2013	07/18/2013	07/19/2013	07/19/2013	07/22/2013
Sample Purpose				RE	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	8.66	27.2	263	16.9	20.6

Location ID			CMI Soil Action Level	S3845	S3847	S3847	S3849	S3850
Field Sample ID				S3845F4	S3847A2	S3847G1	S3849G2	S3850R1G3
Start Depth - End Depth				11.5 - 12	0.5 - 1	12 - 12.5	12.5 - 13	13 - 13.5
Sample Date				07/23/2013	07/24/2013	07/24/2013	07/25/2013	07/26/2013
Sample Purpose				REG	REG	REG	REG	RE
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	5.94 J	30.5	26.6	33.3	18.1

Location ID			CMI Soil Action Level	S3851	S3853	S3856	S3857	S3857
Field Sample ID				S3851H1	S3853G1	S3856G4	S3857E1	S3857G4
Start Depth - End Depth				14 - 14.5	12 - 12.5	13.5 - 14	8 - 8.5	13.5 - 14
Sample Date				07/26/2013	07/29/2013	07/30/2013	07/31/2013	07/31/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	7.27	32.8	43.0	10.5	2.91

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3858	S3858	S3859	S3882	S3883
Field Sample ID				S3858F3	S3858H3	S3859R1F3	S3882R1E2	S3883G2
Start Depth - End Depth				11 - 11.5	15 - 15.5	11 - 11.5	8.5 - 9	12.5 - 13
Sample Date				07/31/2013	07/31/2013	09/12/2013	08/02/2013	08/06/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	7.30	23.6	18.7	29.9 J-	69.1 J-

Location ID			CMI Soil Action Level	S3885	S3886	S3887	S3887	S3889
Field Sample ID				S3885A2	S3886G2	D0809139	S3887G2	S3889A4
Start Depth - End Depth				0.5 - 1	12.5 - 13	12.5 - 13	12.5 - 13	1.5 - 2
Sample Date				08/07/2013	08/07/2013	08/09/2013	08/09/2013	08/12/2013
Sample Purpose				REG	REG	FD	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	25	3.91	26.0	33.7	24.4

Location ID			CMI Soil Action Level	S3889	S3890	S3890	S3903	S3912
Field Sample ID				S3889G3	S3890A4	S3890G3	S3903G3	S3912B2
Start Depth - End Depth				13 - 13.5	1.5 - 2	13 - 13.5	13 - 13.5	2.5 - 3
Sample Date				08/12/2013	08/13/2013	08/13/2013	08/28/2013	08/29/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	4.38	4.16	7.86 J	90.3	5.67

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S3915	S3916	S3919	S3919	S3933
Field Sample ID				S3915R1G2	S3916H3	D0905139	S3919I2	S3933G2
Sample Date				12.5 - 13	15 - 15.5	16.5 - 17	16.5 - 17	12.5 - 13
Start Depth - End Depth				09/13/2013	09/04/2013	09/05/2013	09/05/2013	09/09/2013
Sample Purpose				REG	REG	FD	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	7.74	11.9	5.05	6.89	8.63

Location ID			CMI Soil Action Level	S3935	S3941	S4090	S4092	S4092
Field Sample ID				S3935F4	S3941C3	S4090A3	S4092B1	S4092B1
Sample Date				11.5 - 12	5 - 5.5	1 - 1.5	2 - 2.5	2 - 2.5
Start Depth - End Depth				09/09/2013	09/11/2013	10/21/2013	10/22/2013	10/22/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	32.0	2.53	38.9	19.0	23.3

Location ID			CMI Soil Action Level	S4092	S4093	S4097	S4098	S4125
Field Sample ID				S4092B3	S4093A2	S4097A3	S4098A4	S4125G1
Sample Date				3 - 3.5	0.5 - 1	1 - 1.5	1.5 - 2	12 - 12.5
Start Depth - End Depth				10/22/2013	10/22/2013	10/29/2013	10/30/2013	11/05/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	4.0	14.6	14.4	22.2 J	19.9

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S4127	S4129	S4130	S4130	S4132
Field Sample ID				S4127F2	S4129A3	S4130B3	S4130F2	S4132B1
Start Depth - End Depth				10.5 - 11	1 - 1.5	3 - 3.5	10.5 - 11	2 - 2.5
Sample Date				11/06/2013	11/07/2013	11/08/2013	11/08/2013	11/11/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	90.1	28.7	15.5 J	68.6	4.63

Location ID			CMI Soil Action Level	S4133	S4133	S4133	S4134	S4138
Field Sample ID				D1112139	S4133E2	S4133F1	S4134A1	S4138A3
Start Depth - End Depth				8.5 - 9	8.5 - 9	10 - 10.5	0 - 0.5	1 - 1.5
Sample Date				11/12/2013	11/12/2013	11/12/2013	11/12/2013	11/14/2013
Sample Purpose				FD	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	40.5 J	19.7	6.34 J	128	106

Location ID			CMI Soil Action Level	S4138	S4140	S4142	S4143	S4144
Field Sample ID				S4138F2	S4140B3	S4142B2	S4143A2	S4144D3
Start Depth - End Depth				10.5 - 11	3 - 3.5	2.5 - 3	0.5 - 1	7 - 7.5
Sample Date				11/14/2013	11/15/2013	11/19/2013	11/20/2013	11/20/2013
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	67.5	7.46	469	15.3	8.76 J

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

Table 2
SWMU 34 Arsenic Soil Sample Depths and Analytical Results
No Further Action Report for Arsenic in Surface Soil: Central Yard
Former Chevron Perth Amboy Facility, NJ

Location ID			CMI Soil Action Level	S4145	S4146	S4148	S5413	S5413
Field Sample ID				S4145A2	S4146D3	S4148A3	S5413K2	S5413P1
Start Depth - End Depth				0.5 - 1	7 - 7.5	1 - 1.5	20.5 - 21	30 - 30.5
Sample Date				11/21/2013	11/21/2013	11/22/2013	12/07/2016	12/07/2016
Sample Purpose				REG	REG	REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	9.28	15.9	19.8	3.77	14.9

Location ID			CMI Soil Action Level	S5474	S5488	S5836
Field Sample ID				S5474R1A3	S5488A3	S5836A4
Start Depth - End Depth				1 - 1.5	1 - 1.5	1.5 - 2
Sample Date				06/18/2018	05/30/2017	03/06/2019
Sample Purpose				REG	REG	REG
Parameter	Report Units	Leached		Report Result	Report Result	Report Result
Arsenic	mg/kg	N	20.0 mg/kg	6.54	3.88	17.6

Notes:

1. Yellow shading indicates concentrations in surface soil greater than the CMI action level
2. Orange shading indicates concentrations greater than the CMI action level at intervals deeper than 2 ft bgs

FIGURES

* Aerial photograph dated October 2017 was provided by Parsons.

**AERIAL PHOTOGRAPH OF PERTH AMBOY
FACILITY: CENTRAL YARD**

NFA REPORT FOR ARSENIC IN SURFACE SOIL: CENTRAL YARD



CHEVRON
ENVIRONMENTAL MANAGEMENT COMPANY
PERTH AMBOY, NEW JERSEY

PROJECT #:
451534-31300

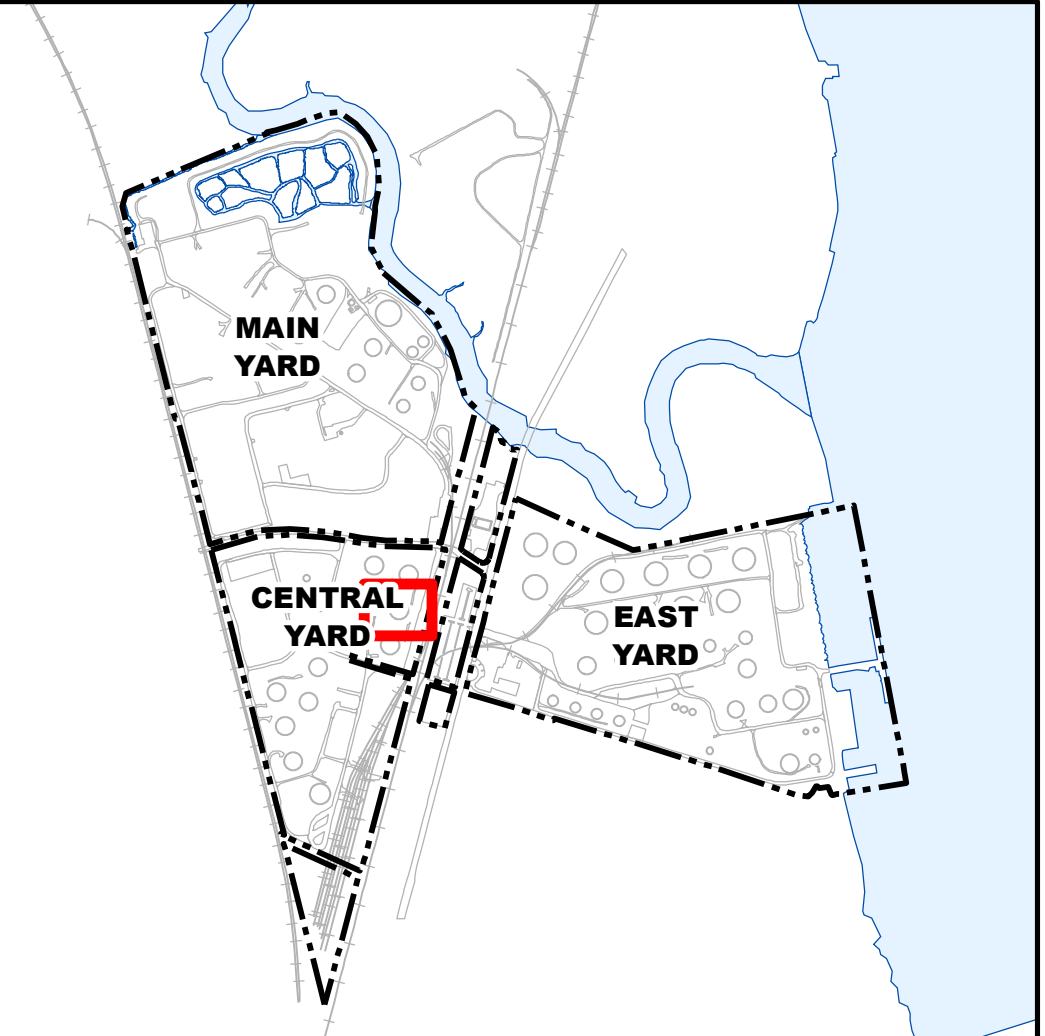
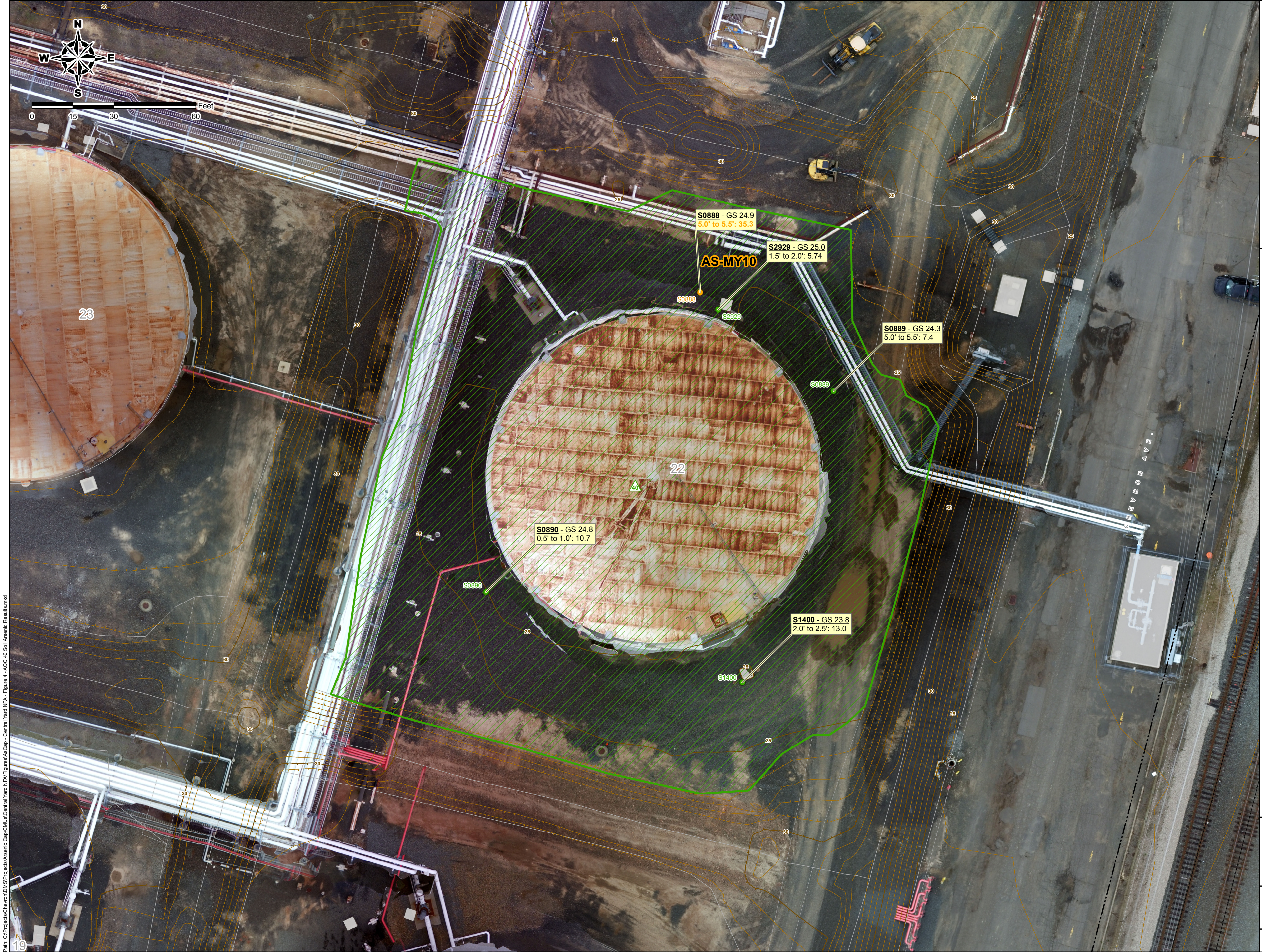
DATE:
2/6/2019

DWN:
ADW

CHKD:
NR

FIG NO.:
2





Legend

- Soil Boring - Arsenic 2ft+ bgs > 20 mg/kg, No 0-2ft bgs Arsenic Analytical Results
- Soil Boring - Arsenic < 20 mg/kg

AOC Boundary

Topographic Contours

- 1' Contour
- 1' Contour Depression
- 5' Contour
- 5' Contour Depression
- Railroad

PERTINENT NOTES:

- Only soil borings with arsenic results in the study area are shown on this figure.
- Sample depths are in feet below ground surface.

Boring ID	Ground Surface Elev. (ft. NGVD)
S4251 - GS 9.0	Red = Exceedance 0-2' ft bgs Orange = Exceedance below 2' ft bgs Black = Arsenic Below CMI Action Limit
5.0' to 5.5': 210.0	Arsenic Results (mg/kg) Sample Depth (ft. bgs)

GENERAL NOTES:

- "U" = Compound not detected above MDL.
- "J" = Estimated concentration less than the reporting limit but above MDL.
- Aerial photograph dated October 2017 was provided by Parsons.
- Topographic contours shown are at 1-ft interval.
- The horizontal datum is the New Jersey State Plane Coordinate System NAD83.
- The vertical datum is the National Geodetic Vertical Datum of 1929 (NGVD29).

ARSENIC RESULTS IN SOIL
AOC 40
CENTRAL YARD NFA REPORT
FOR ARSENIC IN SURFACE SOIL

		CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY PERTH AMBOY, NEW JERSEY			
PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:	
451534-31300	2/6/2019	ADW	NR	4	



LEGEND

● Soil Boring - Arsenic 0-2ft bgs > 20 mg/kg

● Soil Boring - Arsenic 2ft+ bgs > 20 mg/kg, No 0-2ft bgs Arsenic Analytical Results

● Soil Boring - Arsenic 2ft+ bgs > 20 mg/kg, Arsenic 0-2ft bgs < 20 mg/kg

● Soil Boring - Arsenic < 20 mg/kg

● Soil Boring - No Arsenic Results

■ Former Tank Car Loading Rack

Topographic Contours

— 1' Contour

— 1' Contour Depression

— 5' Contour

— 5' Contour Depression

▨ AOC Boundary

▨ PAOC Boundary

▨ SWMU Boundary

▨ Ladder Track Serving as a Cap

PERTINENT NOTES:

1. Only soil borings with arsenic results in the study area are shown on this figure.

2. Sample depths are in feet below ground surface.

Boring ID

S4251 - GS 9.0
5.0' to 5.5': 210.0

Ground Surface Elev. (ft. NGVD)

Red = Exceedance 0-2' ft bgs
Orange = Exceedance below 2' ft bgs
Black = Arsenic Below CMI Action Limit

Arsenic Results (mg/kg)

Sample Depth (ft. bgs)

GENERAL NOTES:

1. "U" = Compound not detected above MDL.

2. "J" = Estimated concentration less than the reporting limit but above MDL.

3. Aerial photograph dated October 2017 was provided by Parsons.

4. Topographic contours shown are at 1-ft interval.

5. The horizontal datum is the New Jersey State Plane Coordinate System NAD83.

6. The vertical datum is the National Geodetic Vertical Datum of 1929 (NGVD29).

ARSENIC RESULTS IN SOIL

SWMU 34

CENTRAL YARD NFA REPORT FOR ARSENIC IN SURFACE SOIL

CHEVRON
ENVIRONMENTAL MANAGEMENT COMPANY
PERTH AMBOY, NEW JERSEY

PROJECT #:	DATE:	DWN:	CHKD:	FIG NO.:
451534-31300	4/12/2019	ADW	JD	5

APPENDIX A

Boring Logs (on CD)

APPENDIX B

Eurofins Lancaster Laboratories Analytical Data Packages (on CD)